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THIS PUBLICATION GIVES INFORMATION on new developments of interest to agriculture based on the work done by scientists and agricultural field men of the du Pont Company and its subsidiary companies.

It also gives reports of results obtained with products developed by these companies in the field whether the tests are made by field men of the companies, by agricultural experiment stations or other bodies. Also data on certain work done by agricultural stations on their own account and other matters of interest in the agricultural field.

This issue contains:

The Performance of "Loro" in Commercial Floral Greenhouses During the Past Year.

Urea as a Fertilizer Material Possesses Various Distinct and Valuable Properties.

Shriveled Seed Wheat Should be Treated Before Planting to Prevent Crop Losses.

Painting During Winter Months Recommended to Maintain Farm Structures and Equipment.

Low-Freezing Dynamites Make Possible Successful Blasting of Frozen Ground.

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THE PERFORMANCE OF "LORO" IN COMMERCIAL FLORAL GREENHOUSES DURING THE PAST YEAR

EDITOR'S NOTE:- This is, in the main, a report of the results of the use of *"Loro" under ordinary greenhouse conditions. The findings are "composite", since they are based on the observations of experimenters and commercial growers in widely distributed areas.

By F. T. Evans, New Products Department,
Grasselli Chemical Company, Cleveland, Ohio.

Commercial florists in several important commercial flower growing areas have been using "Loro" now for well over a year.

The first commercial use of "Loro" by florists occurred in the Cleveland, Ohio area. There twelve to fifteen commercial growers are using "Loro" on certain crops. The use of "Loro" by florists has now spread to other areas of importance in commercial flower production.

In order that "Loro's" place in the greenhouse industry may be clear, a classification of commercial florists follows:

Specialists - the hothouse rose grower, the carnation grower, the gardenia grower, etc.

General Florists - growers of associated crops - carnations, chrysanthemums, pompons, snapdragons, calendulas, asters, etc.

Miscellaneous Crop Growers - this is the group which confines its activities to the production of a wide variety of potted plants. In this group such crops as cineraria, cyclamen, poinsettia, achyranthes, begonias, fuchsias, etc., are found.

As the use of "Loro" spread through all three classes, grower reports indicated that the product was of high efficiency on a number of important insects and that the product had its greatest market among the general florists - growers of carnations, chrysanthemum, pompons, snapdragons, calendulas, asters, as major crops.

"Loro" was found to be unsafe to hothouse roses although control of certain rose insects was satisfactory.

Among the carnation specialists in New England States fumigation has replaced liquid sprays in those areas where carnation blight

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is prevalent. "Loro's" use is limited to spot spraying in those areas. Among a number of important carnation producing areas "Loro" has assumed an important position as a non-staining economical control for red spider, and thrips and aphids when present.

Among those growers of miscellaneous potted plants "Loro" is adaptable to some crops but has not been safe as a rule on cineraria, cyclamen, poinsettia, achyranthes, fuchsias, begonias.

Effectiveness and Advantages

With this "Loro" market in mind - the effectiveness of the product on floral insects will be discussed. This discussion will be based on experimenter and grower reports.

On the carnation crop in general the most troublesome insect pest is red spider. Control has been difficult and considerable loss to growers has occurred in many instances where certain products have discolored blooms. "Loro" has done a remarkable job on red spider control with freedom from bloom stain and where proper spreaders have been used the natural bloom on carnation foliage has not been affected. "Loro" has been used at concentrations of from 1:400 to 1:600 with approved spreaders. The product has a high degree of toxicity in cool house temperatures on red spider eggs as well as active stages of the insect.

On chrysanthemums and pompons under glass or shade cloth enclosures "Loro" in its present form has been safe on practically all varieties excepting the early fall blooming types - under glass. On the late varieties such as Yuletide - a few reports have been received stating that "Loro" had stained the blooms. Certain pink varieties may show a bronzing of the lower leaves particularly when sprays are applied in cloudy weather. This injury is not considered as serious by growers. Growth is not hindered and marketability is not reduced since lower leaves are usually removed by the grower before shipment.

On this important crop, however, "Loro" has done a remarkable job in the control of mealy bug, red spider, thrips, midge, aphids (green and black fly). On the leaf eating worms, usually found on this crop "Loro" has not shown commercial control of a high degree. Effective "Loro" concentrations on these insects have ranged from 1:400 to 1:750 with soap spreaders. Many important "mum" growers have used "Loro" for two seasons on their entire crop from cutting stage to bloom stage. "Loro" is considered by many growers to be their most effective control for chrysanthemum midge.

A number of outstanding instances have been inspected of mealy bug control on mums, under commercial conditions. Rapid clean up with a low degree of reinfestation in "Loro" concentrations of from 1:400 to 1:600 with soap spreaders has been the rule.

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On chrysanthemum thrips a number of growers using "Loro" at an average concentration of 1:600 with approved spreaders are keeping their crops clean by following a regular spray program from cutting to bud stage. In the early crop stages "Loro" sprays at six-week intervals have been reported as effective.

"Loro" has been used on snapdragon crops in all stages of growth principally for aphids, red spider and thrips. No reports of bloom injury have been received. It is considered important, however, that a regular "Loro" spray program be followed in the earlier crop stages so that a limited amount of spraying will be required in the blooming period.

Interesting to Experimenters

From an experimenter standpoint "Loro" has met with considerable interest from those investigators interested in floral insects.

In recent editions of the Journal of Economic Entomology - the active ingredient in "Loro" has been reported by an experimenter of the U.S. Bureau of Entomology as having high toxic effect on Mexican mealy bugs and their eggs on chrysanthemums and in a later edition on effective control of cucumber mites under hot house conditions at Barberton, Ohio.

Confidential reports from a number of experimenters are on file in this department which indicate "Loro" to be effective for mealy bugs and thrips on chrysanthemums; for lice on Florida ferns at 1:600 without spreader; as a general aphicide; on chrysanthemums for red spider and thrips; as an aphicide, and as a control for mealy bugs and red spider when used at 1:400.

Generally therefore grower and experimenter results, insofar as control of insects with "Loro" is concerned have been consistent.

"Loro" as an insecticide is effective on a number of most important floral crops; on other crops of doubtful general importance such as achyranthes, fuchsias, begonias, poinsettias, cineraria, in its present form "Loro" is hardly practical because of injury factor. "Loro" has attained vastly improved and simplified control of red spider, mealy bugs, chrysanthemum and carnation thrips, chrysanthemum midge and most aphids on a number of most important floral crops.

* "Loro", the trade name for a composition of lorol rhodanates developed and manufactured by the Grasselli Chemical Company, Cleveland, Ohio.

UREA AS A FERTILIZER MATERIAL POSSESSES VARIOUS DISTINCT AND VALUABLE PROPERTIES

EDITOR'S NOTE:- Considerable interest is being shown in a recent announcement that domestic production of crystal urea makes this valuable fertilizer constituent readily available to American manufacturers. A discussion of some of the properties of urea is presented below.

By F. W. Parker, Agronomist,
Ammonia Department,
E. I. du Pont de Nemours & Co.

Urea is a white crystalline compound having the formula $CO(NH_2)_2$. The chemically pure compound contains 46.6 per cent nitrogen, and the commercial product is guaranteed to contain 46.0 per cent nitrogen. Du Pont Crystal Urea is shipped in 100-pound paper-lined moisture-proof burlap bags. The crystals are well formed and of fairly uniform size. A typical screen analysis is given in Table 1.

Table 1

Typical Screen Analysis of Du Pont Crystal Urea

Retained on	20	mesh	screen		0	per cent
Through	20	on 28	"	"	2	" "
"	28	" 35	"	"	22	" "
"	35	" 48	"	"	40	" "
"	48	" 60	"	"	13	" "
"	60	" 100	"	"	20	" "
"		100	"	"	3	" "

These data show that 75 per cent of the urea will pass a 28 mesh screen, but will be retained on a 60 mesh screen. Only 3 per cent passes a 100 mesh screen.

Hygroscopicity. The hygroscopicity of a fertilizer material is an important property influencing its usefulness as a material and in mixtures. The data of Table 2 on the hygroscopicity of some common nitrogen fertilizer materials are taken from the work of Adams and Merz (1). The figures indicate the relative humidity of air in equilibrium with a saturated solution of the compound at different temperatures. The smaller the figure, the more hygroscopic the material.

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Table 2

Relative Hygroscopicities of Fertilizer Materials

Material	Humidity of Air in Equilibrium with Saturated Solution				
	15°C.	20°C.	25°C.	30°C.	40°C.
Urea	79.9	80.0	75.8	72.5	68.0
Ammonium sulfate	79.3	81.0	81.8	79.2	78.2
Sodium nitrate	76.8	77.1	74.4	72.4	70.1
Ammonium nitrate	69.8	66.9	62.7	59.4	52.5
Calcium nitrate	55.9	55.4	50.5	46.7	35.5

At 15°C. urea is less hygroscopic than any other compound shown in Table 2. At 20° and 25°C. urea is more hygroscopic than ammonium sulfate, but is less hygroscopic than sodium, ammonium, or calcium nitrate. At 30°C. urea and sodium nitrate are the same as regards hygroscopicity. Both are more hygroscopic than ammonium sulfate and less hygroscopic than ammonium and calcium nitrate. At all temperatures the latter materials are decidedly more hygroscopic than urea. Urea, on the other hand, is less hygroscopic than sodium nitrate except at temperatures above 30°C. (86°F.).

Properties as a Fertilizer. Urea is a unique source of nitrogen in that it has the properties commonly associated with mixtures of different sources of nitrogen rather than one source. As compared with high-grade natural organics, urea is more completely available. A crop will recover a higher percentage of the nitrogen from urea than from natural organics. Like high-grade natural organics, nitrogen from urea is not readily lost by leaching as is nitrate nitrogen. Urea is only slightly acidic, thus differing materially in this important property from ammonium sulfate.

The influence of some of these properties on crop yields is indicated by the results of potato fertilizer experiments given in Table 3. The experiments were conducted in Maine, Long Island, Maryland and Virginia by the U.S. Department of Agriculture and/or experiment stations in the respective states.

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Table 3

Average Yield of Potatoes in Source of Nitrogen Experiments

Source of Nitrogen in Complete Fertilizer	% of Readily Leached Nitrogen	Equivalent Acidity per Unit N	Bushels per Acre: Avg. Yield 22 Crops	Bushels per Acre: Increase from Fertilizer
Sodium nitrate	100	36B	192	75
Ammonium sulfate	0	107	203	86
1/2 sodium nitrate 1/2 ammonium sulfate	50	36	209	92
1/4 sodium nitrate 1/4 ammonium sulfate 1/2 natural organics	25	30	221	104
Urea	-	-	221	104
No nitrogen	-	-	117	-

These data show that a complete fertilizer with all nitrogen from sodium nitrate, slightly basic but easily leached, produced an average yield of 192 bushels. When ammonium sulfate, non-leachable but highly acidic, was the source of nitrogen the yield was 203 bushels. When these materials were mixed to give equal amounts of nitrogen, only one-half of the nitrogen was readily leached and the acidity was low. The yield 209 bushels was better than with either material as the sole source of nitrogen. By deriving the nitrogen from a mixture of sodium nitrate, ammonium sulfate and high-grade organics, the leachable nitrogen was reduced to one-fourth of the total and the acidity of the mixture was further reduced to a low figure. With this combination of sources, the yield was 221 bushels, an increase of 104 bushels over the plot receiving no nitrogen. Urea, a non-leachable source of nitrogen of low acidity and high availability, also produced a yield of 221 bushels. Thus it is indicated that this one material has more desirable properties than any one nitrogen source in common use, and as previously indicated, has the good properties commonly associated with a mixture of different sources of nitrogen.

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(1) Adams, J. R., and Merz, A. R. - Hygroscopicity of Fertilizer Materials and Mixtures. Ind. Eng. Chem., 21, 305-7 (1929).

SHRIVELED SEED WHEAT SHOULD BE TREATED BEFORE PLANTING TO PREVENT CROP LOSSES

EDITOR'S NOTE:- A reported shortage of good seed in parts of North Dakota, South Dakota, Minnesota and other spring wheat-growing sections presents a serious situation, according to observers. This article discusses measures to be taken to minimize losses due to inferior seed wheat.

By G. F. Miles, Research Department,
Bayer-Semesan Company, Wilmington, Del.

Grain growers in some parts of the country may smile at the term "shriveled seed wheat" and remark that there is no such thing. Wheat that is shriveled is certainly not fit for seed. But up in the great spring wheat territory comprising large parts of North Dakota, South Dakota and Minnesota thousands of farmers this spring will be planting wheat which is so badly shriveled it will weigh only 45 to 50 pounds per bushel and some of it even less than that.

But why plant stuff like that, you ask? Well, suppose your seed was all like that; and suppose your neighbor's seed was just as bad; and suppose the same thing was true in the next county and throughout a big part of the spring wheat territory, what would you do? Well, that's just what those spring wheat farmers will do this spring; they will plant the best seed they have, which means planting shriveled seed weighing many pounds below the legal sixty pounds per bushel.

Stem Rust Shrivels Seed

On the first of July last year the spring wheat farmers in that section were anticipating one of the finest wheat harvests they had ever had. As one of the agricultural workers at Fargo remarked, "It looked then as if we would have enough wheat in North Dakota to feed the whole country". Three weeks later fifty to seventy-five per cent of the crop had been destroyed by stem rust. The wheat crop simply shriveled away before their eyes. An examination of the heads disclosed that in many of them no grain had formed at all. In others two or three kernels had developed with the rest of the head barren. And the grain that did develop? Well, that's the forty-five pound stuff they are expecting to plant. All, or most of it, is very badly shriveled.

As the first shock of the enormous loss wore off, grain growers began to think of the future. What about seed for planting the 1936 crop? Would this shriveled grain that looked like screenings germinate and grow? Or was it so weak and so low in viability as to make it worthless for seed?

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Almost before the farmers began asking these and many other inquiries about shriveled seed, the agricultural colleges, crop improvement associations, elevator men, millers and others interested in wheat had gone into action and had begun to take stock of the situation and to get the answers to these questions.

Is It Safe to Treat Shriveled Seed?

One of the questions which came to almost everyone's mind dealt with the effect of seed treatment on this shriveled seed. Would such weak seed be injured by disinfection? Or would seed treatment be beneficial in improving the germination of the seeds and vigor of the seedlings?

Obviously no one could answer the question off-hand; for who had ever thought of planting seed wheat like that, much less treating it? Fortunately, it was possible to get the answer to this particular question by conducting laboratory tests. Samples of this shriveled seed wheat coming from various sections of the affected territory were secured from the terminal elevators in Minneapolis by a commercial laboratory. A portion of each sample was treated with an ethyl mercury phosphate dust, which is commonly used for the treatment of seed wheat as well as oats and barley. Another portion of each sample was left untreated for comparison of the germination and growth. All lots were planted in sand in the laboratory and, after nine days germination counts and observations as to the vigor of the seedlings were made.

Results of Laboratory Tests

For the twenty-seven different lots of seed, ranging in test weight from 40.8 to 62.3 pounds and averaging 50.4 pounds per bushel, the data showed that treatment had not been injurious to the seed. On the contrary, in the case of twenty-four of the twenty-seven seed lots treating the seed had actually increased the germination. The increases in germination ran from insignificant amounts to as high as 35%, the average being more than 8%.

In these laboratory tests many of the samples of shriveled seed, when untreated, showed a germination of 90%. It must be remembered, however, that many weak seeds which will germinate under the favorable conditions of a laboratory will fail to germinate when planted under the cool soil conditions usually prevailing at planting time. When planted in a well prepared seed bed on the average farm, even good, strong seed rarely shows a germination as high as 90%. It must be expected, therefore, that much of this shriveled seed, if planted untreated, will germinate not better than 50 to 75%. Treating the seed for protection against seed decaying and seedling blight organisms will not produce 100% germination, but it will undoubtedly improve the stands to a relatively greater extent than is indicated by the results of the laboratory tests described above.

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In general, it may be concluded that treatment of shriveled seed wheat with ethyl mercury phosphate dust is not only a safe practice, but also that in a majority of cases it will help materially to improve germination of the seed and the stand of plants.

It is to be noted that not all types of commonly used seed disinfectants are suitable for treatment of shriveled seed. The use of some of them may actually do more harm than good. Growers who must plant seed of this sort may save themselves many dollars by consulting their state experiment stations before purchasing seed disinfectants for use on this seed. Most of the experiment stations in the affected territory have studied the serious problem which confronts grain growers this year and are prepared to make special recommendations concerning the treatment of shriveled seed wheat.

PAINTING DURING WINTER MONTHS RECOMMENDED TO MAINTAIN FARM STRUCTURES AND EQUIPMENT

EDITOR'S NOTE:- This article was written by a former farm boy who now is widely known as a technical adviser on industrial and other painting problems. It is presented here with the thought that the recommendations well could be valuable to home economics workers and, perhaps, agricultural engineers interested in farm "plant" maintenance.

By Roy C. Sheeler, Technical Adviser,
Finishes Division, E. I. du Pont de Nemours & Co.

On many farms the winter months are days of more or less leisure,- at least a respite from the more arduous duties of the busy seasons. This makes it possible for the forward-looking agriculturist to lay his plans for the ensuing months and at the same time to take care of certain matters of maintenance that cannot be handled later on. Maintenance of property and equipment is just as necessary on the farm as in the industrial plant. Chief among such needs is surface protection provided by paints, enamels, varnishes, etc. In some districts outside painting is not possible during the winter months. In other areas, however, where weather conditions permit, a great deal of outside work may be done throughout the winter months. How many farm buildings are in need of a new coat of paint, nation-wide? It is any one's guess, but the potential needs in this field are staggering. So, in sections where the weather is not too cold, now would be an excellent time to take care of work of this sort.

Outside Painting Suggestions

All buildings should be examined carefully, making a record of any necessary repairs to gutters, spouting, roofs, siding, etc. Loose and scaling paint should be removed. Dirt and dust should be washed or scrubbed off. Rusty spots on metal surfaces, such as hinges, tracks for overhanging doors, etc. to be scraped off or sandpapered down to a firm, hard surface. Then suitable paints for each type of surface should be purchased. For the house any one of the many standard ready-mixed paints available could be used. These are available in many tints, with suitable trim colors. Be sure to follow the manufacturers' directions for reduction of all coats, depending upon the nature and condition of the surface. Always remember that it is much better to apply two or three thin coats at regular intervals than to try to get by with one thick coat, which cannot satisfy the porosity of the surface and which will inevitably lead to an accumulation of thick, heavy, inelastic

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films of paint, which afford the worst possible foundation for subsequent coats, resulting in ultimate failure of the entire paint covering, from a protection standpoint.

For barns, sheds, out-buildings in general, less expensive yet very durable paints are available. Many pleasing color combinations may be selected from the standard products in stock at your neighborhood store. Be sure you purchase pure raw linseed oil and pure spirits of turpentine for whatever reductions are necessary. Use good quality brushes, wide enough to do a good job, yet not too big to permit of thorough brushing out,- which is so essential to satisfactory results.

Don't overlook roofs of residence and all other buildings. If of shingle construction, an occasional coat of shingle stain will not only add greatly to the appearance of the property, but will preserve and protect the surface. The same type of stain may also be used for shingle siding where found.

Refinishing Interior Surfaces

Surfaces inside buildings offer the best opportunity for winter painting, wherever found. In the home walls, ceilings and general interior trim may be refinished without much inconvenience and with great satisfaction. There is no need today for the farm kitchen to be the dreary, drab place that is so often the case. If papered, and if repapering is desired, the farm family may do this themselves or else have a paperhanger do the work.

It is in the paint field, however, that the greatest possibilities exist for improved home conditions. Finishes are available today for use on every conceivable surface, in every tint and hue imaginable. They may be had in flat, egg-shell or gloss, as desired. They are so easy to use and accomplish such amazing results that the entire interior of the home can be done over at relatively slight expense. The days of drab, cheerless rooms may well be considered as a thing of the past. They need not be tolerated anywhere, if there is a will to improve.

Added Attractiveness for Furniture

Many farm homes possess prized pieces of furniture which could be made to look like new again for a very small cost. Sometimes this only means a new coat of a good furniture varnish. Other pieces may be so shabby that nothing but an entire new finish will suffice. In the latter case there are quick-drying enamels of every tint in the rainbow that in one or two coats, with suitable contrasting trim, will make a piece of furniture as good as new, and often a great deal more attractive. Any paint dealer will be glad to talk over finish problems and give the benefit of his best suggestions and advice.

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Sanitation on the Dairy Farm

Dairy farms are required to practice sanitation to the last degree. The modern farm of this type is an example of the last word in cleanliness. Paints and enamels fit into this picture well. It is a known fact that a fresh coat of paint on surfaces that are paintable is one of the best antidotes for unsanitary conditions. There are quick-drying finishes available which are non-poisonous and which may be applied to stanchions, stalls and other surfaces contacted by farm animals. Winter is a good time to do "sanitary" painting.

Maintenance of Farm Machinery

The protection and care of farm machinery offers the largest field for winter painting the country over. These units as a rule are expensive. Their tenure of life may be greatly extended with periodical care. Regular greasing and oiling, tightening of nuts and bolts, cleaning of dirt and dust, followed by refinishing when desirable will add many years to the usefulness of these farming essentials. Most important of all is the storage of equipment, when not being used, away from the weather. Needless exposure to rain, sun, heat and cold has ruined many thousands of dollars worth of farm machinery. The astute farmer takes care of his equipment the same as he does of his animals; it is only the careless and improvident man that permits his harvesting machinery to repose over the winter underneath the trees. It is a joy and pleasure to work with new machinery. Just as big a thrill may be experienced by painting up used equipment, giving it a general overhauling, all at a fraction of the cost of a new article. Enamels are obtainable that have wonderful hiding power, brilliance of color and durability. A very small sum invested in such materials pays big dividends in appearance, service and satisfaction.

LOW-FREEZING DYNAMITES MAKE POSSIBLE SUCCESSFUL BLASTING OF FROZEN GROUND

EDITOR'S NOTE:- The fact that frozen ground can be blasted offers possibilities of the extension of the uses of dynamite for agricultural and other purposes. Further developments may be expected as the result of study and experiments by agricultural engineers and others.

By L. F. Livingston, Manager,
Agricultural Extension Section,
E. I. du Pont de Nemours & Co.

Blasting frozen ground is entirely feasible, despite the fact that to within the past few years little, if any, of such work was attempted. However, there is still considerable experimental work to be done before anything like standardized methods are developed. But from the standpoint of explosives, the problem was solved when chemists long ago made available low-freezing dynamites which may be used at low temperatures.

Practical applications of frozen-ground blasting include excavating for foundations for barns or other structures, the making of "root" cellars, the planting of ornamental and shade trees around the farmhouse or elsewhere and for various other purposes. In one of the New England States a drainage ditch was successfully blasted, though it required considerable labor to remove the fragments of hard-frozen earth.

Obviously, the electrical method of detonating the charges, involving the use of electric blasting caps and a blasting machine, must be used for shooting two or more holes at one time. The absence of water in the soil, of course, prevents blasting by the more economical and efficient propagated method. A blasting cap and fuse may be used for priming single-hole shots.

Suggestions for Blasting Frozen Ground

The most difficult part of the operation is the making of holes. This can best be done with a rock drill, but a pointed steel bar of 2-inch diameter can be used. Where but a few holes are required, the use of a bar should prove satisfactory.

It is recommended that 40 per cent Red Cross "Extra" Dynamite be used. The amount of dynamite necessary depends upon the depth of frost. Ordinarily, one stick of dynamite for each foot of depth of frost should be sufficient. However, it is always advisable to make a few test shots to accurately determine how much explosive is necessary.

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The spacing of the holes is important and it should be made a rule never to place them more than four feet apart. While it is a fact that blasting in frozen earth enables dynamite to do more "work" than in the case of soft material, it must be remembered that the former is in degree comparable in hardness with rock. The reason why hard material gives greater efficiency to a dynamite blast is because the force of the explosion is better confined and is not dissipated by "cushioning", due to the lower resistance of soft earth, or the too rapid escape of the gases generated by an explosion.

It is especially important to take care not to load the dynamite below the frost line. The effect of an explosion below a stratum of frozen earth would be to form a pocket in softer material and not break through to any great extent at the surface.

Precautions to Observe When Blasting

When a blast is set off in frozen ground, fragments of stone-like hardness are likely to be thrown for a considerable distance. Among the safeguards against possible injury to the blaster that should be provided are:

1 - Blasting machine leading wires of sufficient length, or adequate length of fuse.

2 - A barricade that will provide protection at the front and over head.

3 - A covering of brush over the area to be blasted. This covering should be rather thick, especially if the blasting is to be done near buildings.

Blasting of this sort should be done only by a blaster who is thoroughly familiar with safety rules and observes them strictly.

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